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PHYTOPHAGOUS INSECT FAUNA OF *BACCHARIS SAROTHROIDES* GRAY (ASTERACEAE) IN ARIZONA AND NEW MEXICO

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Abstract.—Phytophagous insects representing seven orders, 26 families, and 64 species were collected on the unisexual shrub desert broom, *Baccharis sarothroides* Gray, a native plant of the southwestern United States. Twenty-five species fed in two or more plant families, six species fed only within the Asteraceae, and five species fed only on *Baccharis* species. No severe foliage or stem damage due to feeding by the insects was observed.

Key Words: Desert broom, plant-feeding insects, ecology

Desert broom, *Baccharis sarothroides* Gray (Asteraceae: Astereae), is an attractive, erect, unisexual, woody shrub, 1 to 4 m in height with broom-like branches and resinous evergreen leaves and stems. Native to the southwestern United States, desert broom is common in sand or gravel riparian washes, drainage areas, and low hills at elevations of 300–1500 m above sea level (Benson and Darrow 1981, Lee et al. 1984).

The few leaves present on desert broom are simple, linear, alternate, and up to 2 cm long; margins are entire. Flower heads are dioecious, discoid in shape, usually solitary, and occur on elongate leafless twigs. Female heads contain about 10 florets and are 6–8 mm in length; male heads are 3–4 mm in length. Flowering is dependent on rainfall and may occur between August and November. Leaves and stems are not palatable to livestock. The many achenes are about 0.25 mm long, 10-nerved, glabrous, and dispersed by wind. The white pappus is 2–2.5 cm long and conspicuous during bloom (McGinnies 1986, Munz and Keck 1968, Vines 1960).

Desert broom is often seen in the front yards of residential properties and is sold by nurseries in Arizona for landscaping in dry environments because it is drought-resistant and tolerant of temperature extremes and saline water. Recently, a low-growing hybrid, *B. sarothroides* × *B. pilularis* DeCandolle, was developed at the Arizona Agricultural Experiment Station, Tucson, for use in xeriscaping. This new shrub, named "Centennial," is a compact, prostrate, leafy, green bush which survives summer heat of up to 45°C without wilting (Lee et al. 1984, Thompson 1985).

Desert broom was tested on different soil types for use in the reclamation of copper mine waste areas in Arizona. Initially, the plant did poorly, but in the second year, height, vegetation yield, and ground cover compared well with the four other shrubs in the test (Day and Ludeke 1980). Although two years is an insufficient period of time for a proper evaluation, this shrub may be one of several plants which are beneficial for reclaiming disturbed mine soils.

Pellet (1930) considered desert broom to

be locally important for honey production because it blooms in the fall when few other flowers are available.

Insects were previously collected on desert broom in Arizona from July to September by Meyer et al. (1979). Of the 25 species collected, 8 were phytophagous and the remaining species were predators or parasites. Other surveys for insects of *Baccharis* in the United States have been made of *B. halimifolia* L. (Bennett 1963, Palmer 1987) and *B. pilularis* (Tilden 1951).

We investigated the phytophagous insects of *B. sarothroides* as part of a study of insects associated with the genus *Baccharis*. Although this is a beneficial shrub, it is closely related to *B. salicifolia* (R&P) Pers., *B. neglecta* Britt., and *B. halimifolia*, three weedy shrubs that we are studying as potential targets for biological control. This paper is the second in our series; the first paper (Boldt and Robbins 1987) reported the phytophagous insects of *B. neglecta* in Texas.

Materials and Methods

We examined plants of *B. sarothroides* on 33 occasions from June 1985 to September 1987 at sites near Rye, Picacho, Gila Bend, Tucson, Sasabe, and Dragoon, Arizona as well as Rodeo and Lordsburg, New Mexico (Fig. 1). Up to four of the eight sites were visited each month of the year. At each site, insects were handpicked, aspirated, or swept from 10 to 20 plants. Immature insects that were collected were reared to maturity on excised plant material and adults found resting on the plant material were caged on leaf bouquets in the laboratory to confirm their ability to feed on the plant. Male and female flower heads were collected in bulk from near Tucson in October 1986; some were dissected while the remainder were held for emergence. Detailed collection and rearing records were maintained so that we could estimate the relative frequency of each insect species collected and record collection data, plant association, and plant phenology. We deposited voucher insect specimens in the insect collection of the Temple laboratory.

Results and Discussion

The distribution of desert broom is presented in Fig. 1. This shrub is abundant in central and southern Arizona but occurs in the Sonoran Desert and desert grasslands from New Mexico to California, Baja California, and Sonora, Mexico. It is also recorded from Sinaloa, Mexico (Benson and Darrow 1981, Munz and Keck 1968, personal observations).

Desert broom was the host or alternate host for 64 species of phytophagous insects representing seven orders and 26 families excluding those that feed exclusively on pollen (Table 1). At least 38 (59.4%) reproduced and developed to maturity on this plant, and 12 (18.7%) of these were endophagous as immatures.

Three (4.7%) species (Table 1) also feed on two related shrubs, *B. neglecta* and *B. halimifolia* (Boldt and Robbins 1987, Palmer 1987): *Nysius raphanus* Howard, *Lygus lineolaris* (Palisot de Beauvois), and *Neolasioptera lathami* Gagné. In addition, four (6.2%) species: *Frankiniella occidentalis* (Pergande), *Hesperotettix viridis viridis* Thomas, *Brochymena quadripustulata* (F.), and *Clastoptera lineatocollis* Stål (Table 1) were also collected from *B. neglecta* in Texas by Boldt and Robbins (1987). Palmer (1987) listed one (1.6%) species, *Acanthocephala thomasi* (Uhler) from *B. halimifolia*. Only *Chrysobothris bacchari* Van Dyke (Table 1) was also listed by Tilden (1951) on *B. pilularis* in California. The aforementioned insects are polyphagous except for the gall midge, *N. lathami*, and the flatheaded borer, *C. bacchari*.

The following insects on desert broom were listed in the literature but not collected by us: *Dactylotum bicolor variegatum* (Scudder), *Melanoplus desultorius* Rehn, *Aztecacris gloriosa* Hebard, *Poecilotettix pantherina* (F. Walker), and *Poecilotettix sanguineus* Scudder (Ball et al. 1942); *Agri-*

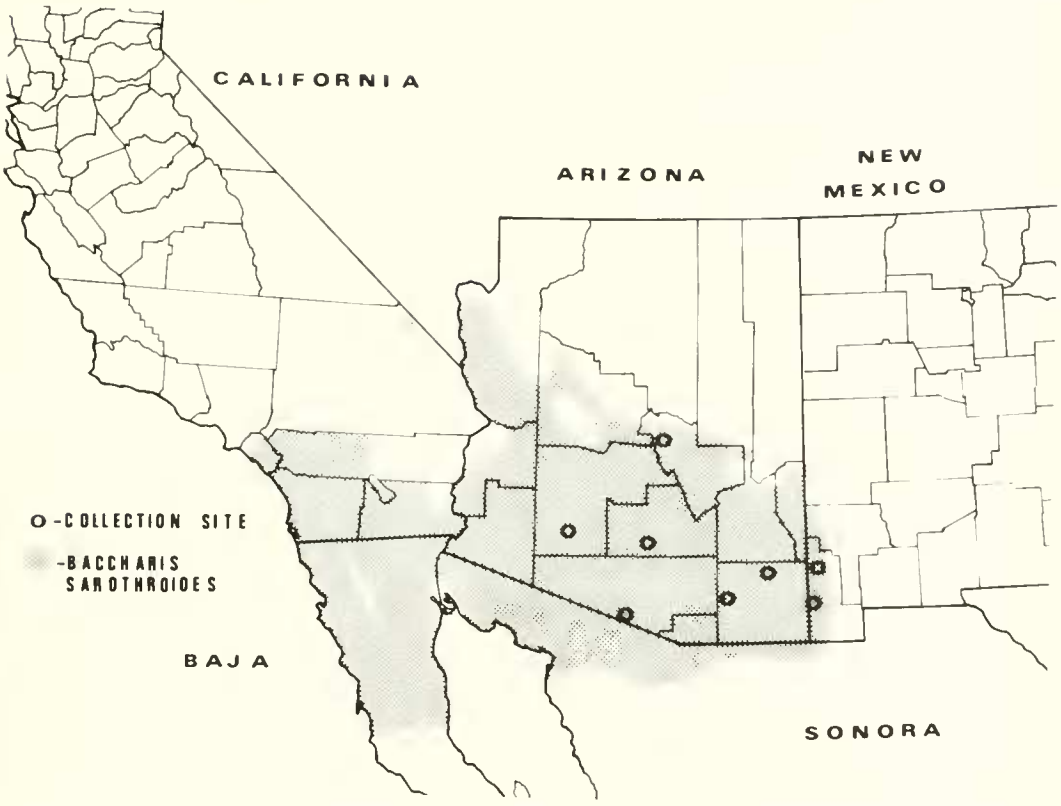

Fig. 1. Insect collection sites and distribution of *Baccharis sarothroides* in the United States and Mexico.

lus aurilatera Waterhouse (Hespenheide 1974), and *Tragidion annulatum* LeConte (Meyer et al. 1979).

In April and May 1987, we collected several larvae of each of two noctuids, *Cucullia laetifica* Lintner and *Platysenta videns* (Guenée), from leaves of desert broom growing in pots in our nursery at Temple, Texas. We reared five *C. laetifica* and one *P. videns* to adults. The only other confirmed host plant of *C. laetifica* is *B. neglecta* (Boldt and Robbins 1987). Other *Cucullia* feed on leaves and flowers of various Asteraceae (R. W. Poole, pers. comm.). *Platysenta videns* occurs east of the Continental Divide (Crumb 1956). We, therefore, concluded that this noctuid does not normally attack desert broom. Crumb (1956), however, collected larvae of another species on this plant in Arizona which he identified as *Platysenta* sp. No. 29 but was unable to rear them to adult for species identification.

According to published literature and available host records for the 51 identified species (Table 1), we determined that 25 (39.1%) were polyphagous because they fed on plants outside the family Asteraceae. Eleven (17.2%) of these are pests of economically important plants and feed on desert broom during the winter or spring when their annual hosts are not available. This percentage is similar to the 18% of identified insects on *B. neglecta* which were listed as pests by Boldt and Robbins (1987) and illustrates the role of these shrubs in harboring pests. We listed six (9.4%) species as oligophagous because they fed on plants within the Asteraceae and six (9.4%) as monophagous because they apparently fed only on the genus *Baccharis*. The gall midge

Table 1. Phytophagous insects collected from *B. sarothroides*.

Insects	Month Collected		Relative Frequency[a]	Associated Plant Part[b]	Host Specificity[c]	References
	Immature	Adult				
Orthoptera						
Acrididae						
Aztecacris gloriosa (Hebard)	Aug.–Oct.	Oct.–Jan.	R	L	O	Ball et al. 1942
Dactylotum bicolor variegatum (Scudder)	June	June–Oct.	O	L	P	Ball et al. 1942
Hesperotettix viridis viridis (Thomas)		Aug.–Sept.	O	L	O	Ball et al. 1942
Melanoplus desultorius Rehn		July–Nov.	R	L	O	Ball et al. 1942
M. pictus Scudder	Aug.–Oct.	Aug.–Oct.	C	L	PE	Ball et al. 1942
Poecilotettix pantherina (F. Walker)	Apr.–Aug.	Apr.–Nov.	R	L	P	Ball et al. 1942
P. sanguineus Scudder	Mar.–Apr.	Apr.–Aug.	O	L	P	Ball et al. 1942
Schistocerca alutacea shoshone (Thomas)		Sept.–Oct.	R	L	PE	Ball et al. 1942
Thysanoptera						
Thripidae						
Frankliniella minuta (Moulton)		Oct.	R	F	P	
F. occidentalis (Pergande)	Feb.–Oct.	Feb.–Oct.	C	F	PE	Yudin et al. 1986
Heteroptera						
Coreidae						
Acanthocephala femorata (F.)	Aug.–Sept.	July–Sept.	O	F	P	Meyer et al. 1979
A. thomasi (Uhler)	Aug.–Sept.	July–Sept.	O	F	P	Meyer et al. 1979
Lygaeidae						
Lygaeus reclivatus (Say)		Oct.–Dec.	O	L, St, F	P	
Melanopleurus belfragei (Stål)		Aug.–Oct.	R	L, St, F		
Nysius raphanus Howard	Sept.–Jan.	May–Jan.	C	L, F	PE	Ward et al. 1977
Ochrimnus foederatus (van Duzee)		Oct.–Nov.	R			Brailovsky 1982
Miridae						
Lygus desertinus Knight	Oct.–Dec.	May–Dec.	R	L, F	P	
L. hesperus Knight	Oct.–Dec.	May–Dec.	O	L, F	PE	Graham et al. 1986
L. lineolaris (Palisot de Beauvois)	Oct.–Dec.	May–Dec.	O	L, F	PE	Young 1986
Parthenicus baccharidus Knight	Apr.–Sept.	Apr.–Jan.	O	L, F		
Rhinacloa forticornis (Reuter)		Aug.–Nov.	R	L, F, St	P	

Table 1. Continued.

Insects	Month Collected: Immature	Month Collected: Adult	Relative Frequency[a]	Associated Plant Part[b]	Host Specificity[c]	References
Pentatomidae						
Brochymena quadripustulata (F.)		Feb.–May	O	St	P	Gamboa and Alcock 1973
Homoptera						
Acanaloniidae						
Acanalonia clypeata Van Duzee		Aug.–Sept.	O	L, St		
Acanalonia fasciata Metcalf	Aug.–Sept.	Aug.–Sept.	O	L, St		
Aphididae						
Brachycauda helichrysi (Kaltenbach)	Mar.–May	Mar.–May	O	L, St	P	
Cercopidae						
Clastoptera lineatocollis Stål	Mar., Aug.	May, Aug.–Dec.	O	St	P	Doering 1942
Cicadellidae						
Aceratagallia sp. A		Jan., May, July	O	L, St		
Aceratagallia sp. B		July–Aug.	C	L, St		
Empoasca sp.	May	Jan.–Dec.	C	L, St		
Homalodisca lacerta (Fowler)	Aug.–Sept.	Aug.–Nov.	O	L, St		
Idiocerus sp.		Nov.–Mar.	C	L, St		
Stragania robusta (Uhler)		Aug.–Sept.	O	L, St	PE	Fletcher 1937
Cixiidae						
Oecleus productus Metcalf		Apr.–Sept.	C	L, St		
Eriococcidae						
Ovaticoccus californicus McKenzie			R	L		McKenzie 1964
Flatidae						
Mistharnophanita sonorana Kirkaldy		Aug.	O	L, St		
Ormenis prob. *yumana* Ball		May, Aug.–Sept.	O	L, St		
Membracidae						
Hypsoprora neglecta Ball		May–Nov.	C	St		
Spissistilus festinus (Say)		Mar., Aug.–Oct.	O	St	PE	Mueller and Dumas 1987
Psyllidae						
Trioza collaris Crawford	Nov.–Jan.	Aug.–Mar.	C	L, F, G	M	Tuthill 1945
Coleoptera						
Buprestidae						
Agrilus aurilatera Waterhouse			C	St		Hespenheide 1974
Chrysobothris baccharis VanDyke	Sept.–June	June–July	O	St, R	M	Nelson et al. 1981
C. beyeri Schaeffer	Sept.–June	June		St, R		Werner (pers. comm.)

Table 1. Continued.

Insects	Month Collected		Relative Frequency[a]	Associated Plant Part[b]	Host Specificity[c]	References
	Immature	Adult				
Cerambycidae						
Stenodontes lobigenis (Bates)	Sept.–June	July–Sept.	O	R	PE	Werner (pers. comm.), Linsley 1962
Tragidion annulatum LeConte	Oct.–Aug.	July–Sept.	O	St, R	P	Meyer et al. 1979; Linsley 1962
Chrysomelidae						
Exema deserti Pierce	May–Aug.	May–Sept.	O	L	P	
Systena blanda Melsh.		Aug.–Sept.	C	L	PE	
Curculionidae						
Anthonomus stolatus Fall		Aug.–Sept.	R	L, F		
Lixus pervestitus Chittenden		Sept.	R	St		Werner (pers. comm.)
Smicronyx undescribed sp.		Aug.–Sept.	R	F		
Lepidoptera						
Ctenuchidae						
Ctenucha venosa Walker	Aug.	Sept.–Oct.	R	L, F		
Gelechiidae						
Aristotelia argentifera Busck	May–Sept.	May–Oct.	C	L, St		
Gnorimoschema undescribed sp.	Apr.–Nov.	Dec.–Mar.	O	St, G		
Geometridae						
Anavitrinella sp.	Feb.–Mar.	Mar.–Apr.	R	L	P	
Elpiste metanemaria (Hulst)	Mar.–May, Aug.–Sept.	Mar.–June, Sept.–Nov.	O	L		
Lyonetiidae						
Bucculatrix sp. near *seorsa* Braun	Dec., Apr.–May, Aug.	Jan.–Feb. June, Aug.–Sept.	O	L		Braun 1963
Pterophoridae						
genus unknown	Mar.–June		R	St		
Diptera						
Cecidomyiidae						
Neolasioptera lathami Gagné	Mar.–Oct.	Mar.–Oct.	C	St, G	M	Diatloff and Palmer 1986
Tephritidae						
Aciurina mexicana (Aczél)	Feb.–Apr.	Oct.–June	O	St, G	M	Steyskal 1984
A. thoracica Curran	Feb.–Apr.	Feb.–July	O	St, G	M	Steyskal 1984
Euarestoides acutangulus (Thomson)		Oct.–Feb.	O	F	OE	Goeden and Ricker 1986
E. flavus (Adams)	Oct.–Jan.	Aug.–Apr.	O	F		Wasbauer 1972
Tephritis arizonaensis Quisenberry	Oct.–Nov., Mar.–Apr.	Jan.–Dec.	C	F, St, G	M	Foote and Blanc 1963
Trupanea nigricornis (Coquillett)	Oct.–Nov.	Nov.	R	F	O	Goeden 1985
Trupanea wheeleri Curran	Oct.–Nov.	Mar., Aug.–Nov.	C	F	O	Goeden 1985

was tested for host specificity and released in Australia as a biological control agent for *B. halimifolia* (Diatloff and Palmer 1987). The remaining five monophagous species may also be potential biological control agents for *B. halimifolia*, although they were not tested for host specificity and their impact on the plant was not assessed.

The host specificity of 29 (45.3%) species collected on desert broom was not determined because their identification was incomplete or host records were unknown or not available. Based on the host plant record of other species in the genus, some of these may be found at a later date to be monophagous or oligophagous. At least two of the unidentified insects were apparently undescribed.

We collected insects on desert broom during every month of the year. The largest number of adult species, 39 (60.9%), was collected in both August and September when normal daily mean temperatures were 21 and 23°C (Wallis 1977) and the least number, 9 (14.1%), was collected in January when normal daily mean temperature was 10.5°C.

About 40 (62.5%) insect species, most of which were Hemiptera and Homoptera, fed on the leaves and small stems; 21 (32.8%) species fed entirely or partly on the flowers and another 12 (18.7%) fed in the stems or both roots and stems. Various insects, such as bees, ants, syrphids, and beetles were also encountered feeding on the resinous exudate of the stems and leaves but they were not collected.

Seventeen (26.6%) species were recorded as rare because they were encountered at a density of less than one per ten plants. Many of them were identified only to genus, and many are polyphagous insects for which desert broom may not be an important plant. Of the 15 (23.4%) species that were recorded as common because they were encountered at a density of more than one per plant, seven were polyphagous species of sap-feeding Hemiptera and three were species of stem- or flower head-feeding Diptera.

At no time during our collecting did we observe widespread foliage or stem damage due to feeding insects, although we occasionally found isolated areas of shrubs with stem and leaf damage which we attributed to feeding by grasshoppers. No obviously destructive insects were encountered on desert broom such as the chrysomelid leaf feeder, *Trirhabda bacharidis* (Weber), on *B. neglecta* and *B. halimifolia* (Boldt and Robbins 1987), or *T. flavolimbata* (Mannerheim) and the gall midge, *Rhopalomyia californica* (Felt), on *B. pilularis* (Tilden 1951).

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[a] C, common, more than one per plant; O, occasional, less than one per plant but more than one per 10 plants; R, rare, less than one per 10 plants.

[b] L, leaf; St, stem; R, root; F, flower head; Sd, seed (achenes); G, gall on stem.

[c] M, monophagous (apparently restricted to the genus *Baccharis*); O, oligophagous (apparently restricted to the Compositae); P, polyphagous (apparently feeds on various plant families); E, economically important (see Literature Cited).

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